Chagas disease in your backyard?

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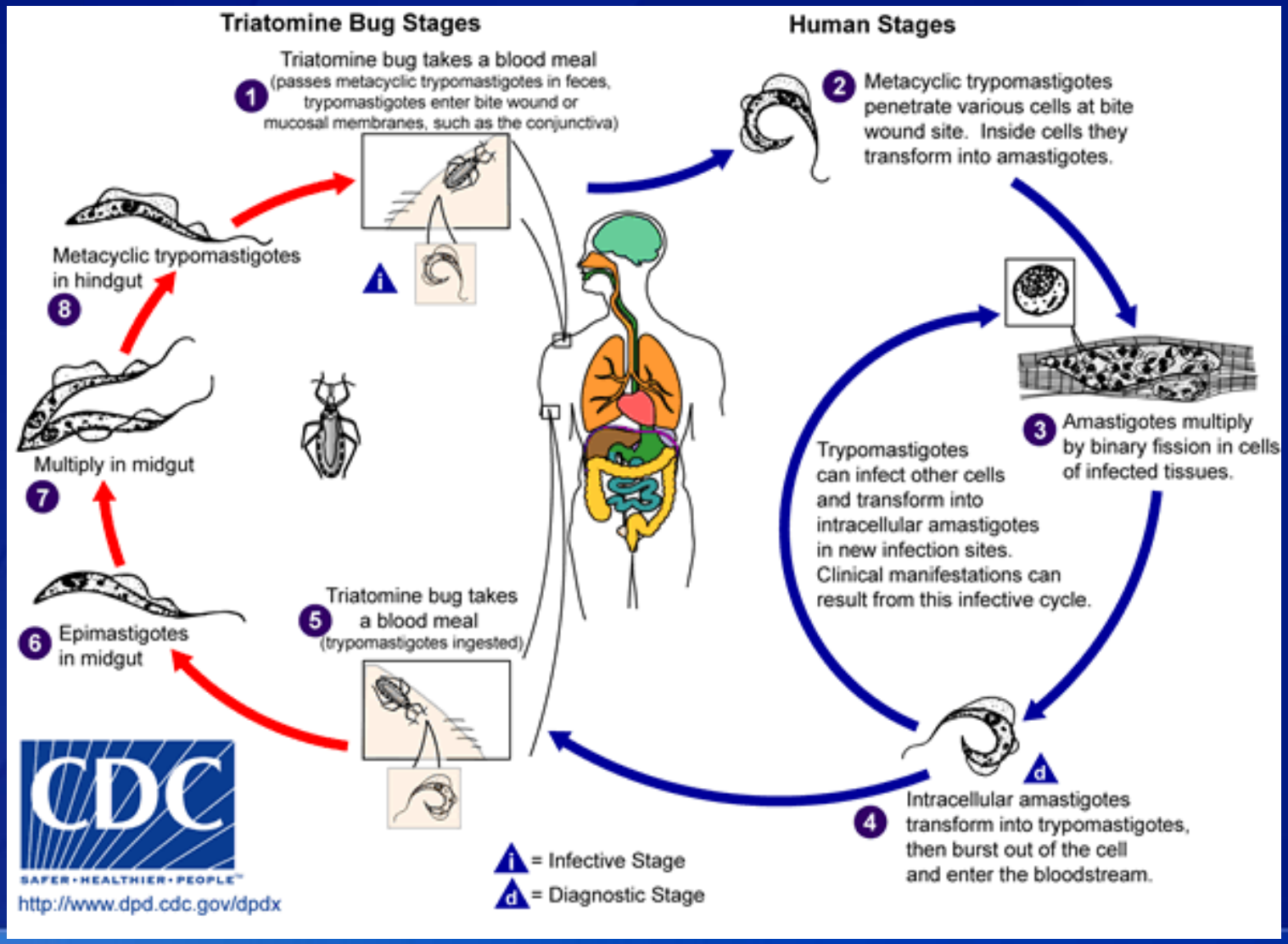
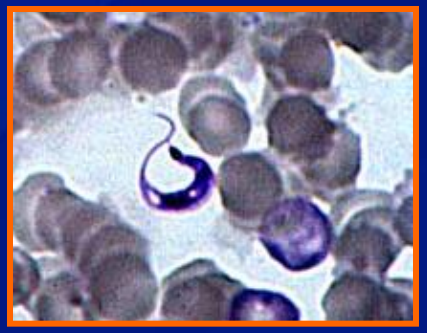
Chagas disease basics

- **Protozoan parasite *Trypanosoma cruzi* only found in the Americas**
- **Vector-borne zoonosis, many animal reservoirs**
- **Transmission**
  - Triatomine bugs – most common
  - Congenital
  - Contaminated blood components, organ or tissue
  - Laboratory accidents
  - Foodborne
- **Estimated 8 – 11 million people have Chagas disease in Latin America**

Trypanosoma cruzi



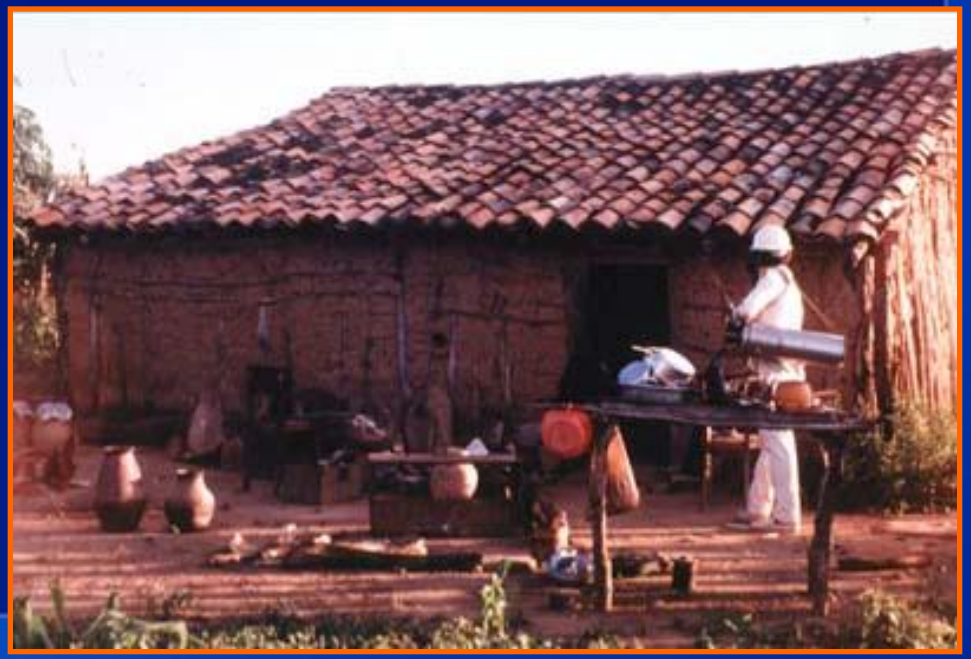
Chagas disease transmission

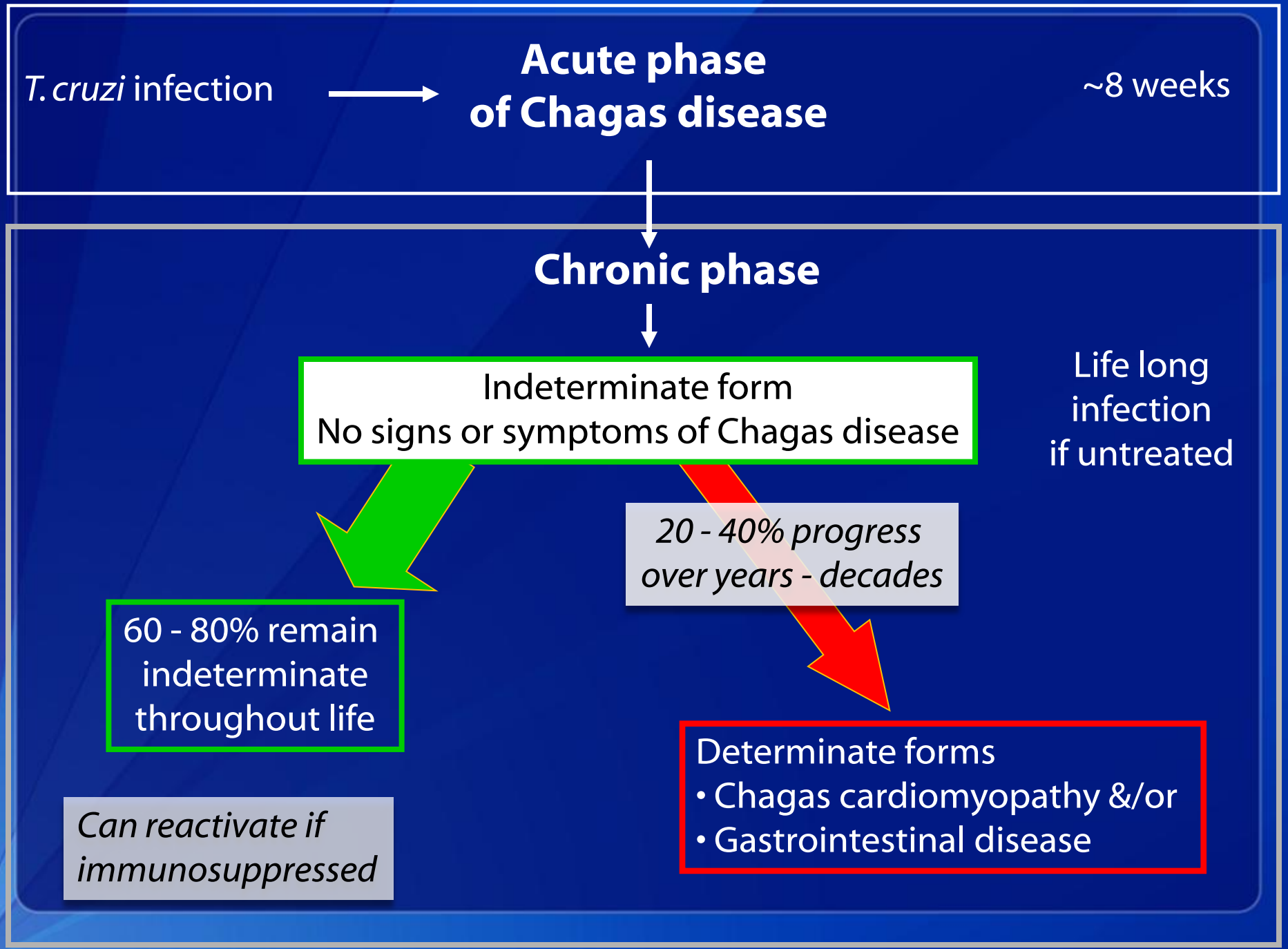


Trypanosoma cruzi

Mammalian hosts

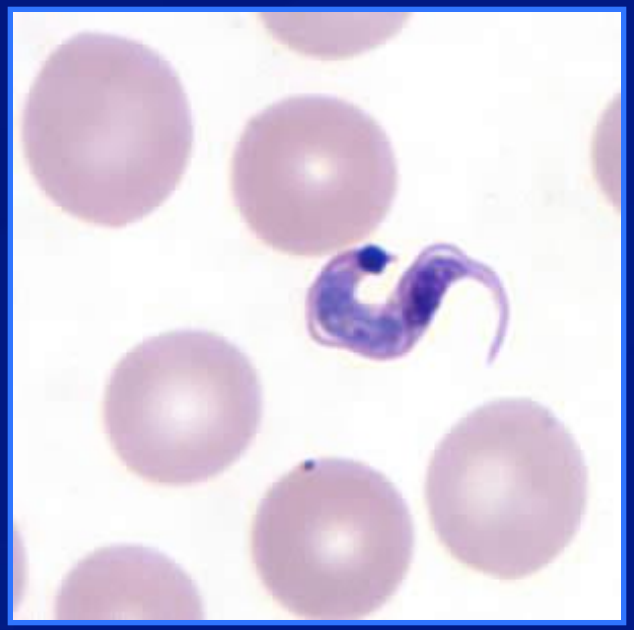
Triatomine vectors




T. cruzi infection
Acute phase of Chagas disease
~8 weeks
Chronic phase
Indeterminate form
No signs or symptoms of Chagas disease
Life long infection if untreated
20 - 40% progress over years - decades
60 - 80% remain indeterminate throughout life
Can reactivate if immunosuppressed
Determinate forms
• Chagas cardiomyopathy &/or
• Gastrointestinal disease

Clinical diagnosis of Chagas disease

- **Acute infection**
  - Identifying the parasite in blood smear or buffy coat
  - Blood cultures
  - PCR can have limited sensitivity
- **Chronic infection**
  - Persistent circulating antibody
  - Problems with specificity and sensitivity
  - No gold standard test for Chagas disease



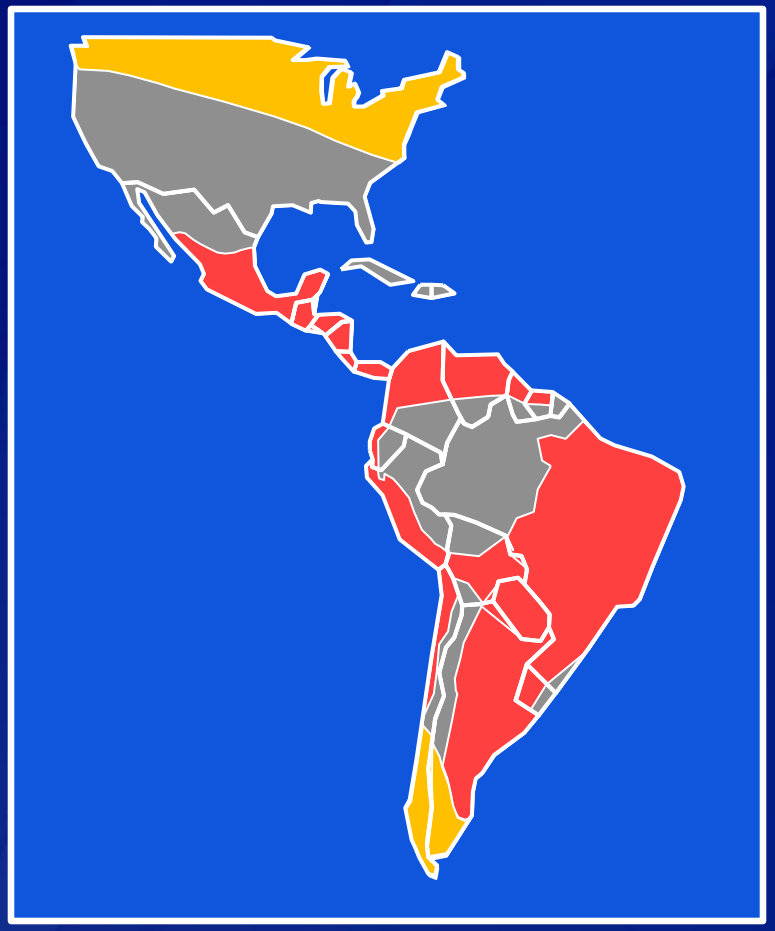
Anti-parasitic treatment

- Nifurtimox and benznidazole
- Most effective during early infection
- Difficult to tolerate
- Not FDA approved, only available from CDC under investigational new drug (IND) protocols

Chagas disease worldwide

- **Programs in Latin America focus on controlling transmission**
  - Vector control
  - Blood safety
- **WHO Global Network for Chagas disease, 2007**
  - Endemic and non-endemic countries
  - Unique situation in the U.S.
- **Renewed attention to control**
  - World Health Assembly resolution in 2010
  - PAHO resolution in 2010
- **Drug donation (nifurtimox) to WHO**

Estimated current prevalence in endemic countries



> 3%

- Bolivia
- Argentina
- El Salvador
- Honduras

1 - 3%

- Paraguay
- Guatemala
- Ecuador
- Guayana
- Venezuela
- Nicaragua
- Mexico
- Brazil

< 1%

- Chile
- Belize
- Peru
- Uruguay
- Costa Rica
- Panama

Endemic for human Chagas disease

Infected vectors, nonhuman mammals

History of triatomines and *T. cruzi* in the United States

- 1855 – Vector bugs identified in Georgia
- 1860's / 70's – Vector bugs identified in six more states
- **1909 – Discovery of parasite and disease (Brazil)**
- 1916 – Parasite first observed in California
- 1930's – Reservoir host infections studied in U.S.
- 1955 – First autochthonous cases of Chagas disease reported

Who is at risk in the U.S.

- **People who acquired the infection in endemic countries of Latin America**
  - Estimated > 300,000 infected immigrants in U.S.*
  - Travelers to endemic areas
- **People who acquire the infection in the United States**
  - Children of infected mothers
  - Laboratory staff working with vectors, reservoir species, or parasite
  - Transplant recipients
  - Transfusion recipients
  - Exposed to infected vectors / reservoirs

*Bern and Montgomery, Clin Infect Dis 2009

Congenital and laboratory transmission cases

- **Estimated between 63 – 315 babies born with Chagas disease every year***
- **Confirmed congenital transmission case in 2010**
  - Mother originally from Bolivia
  - Baby born with evidence of disease
- **Transmission associated with laboratory accident**
  - 8 cases reported in United States
  - 3 needlestick injuries
  - 3 contact with infectious materials / break in skin
  - 2 unknown route of infection

* Bern and Montgomery, Clin Infect Dis 2009

Transplant transmission in the U.S.

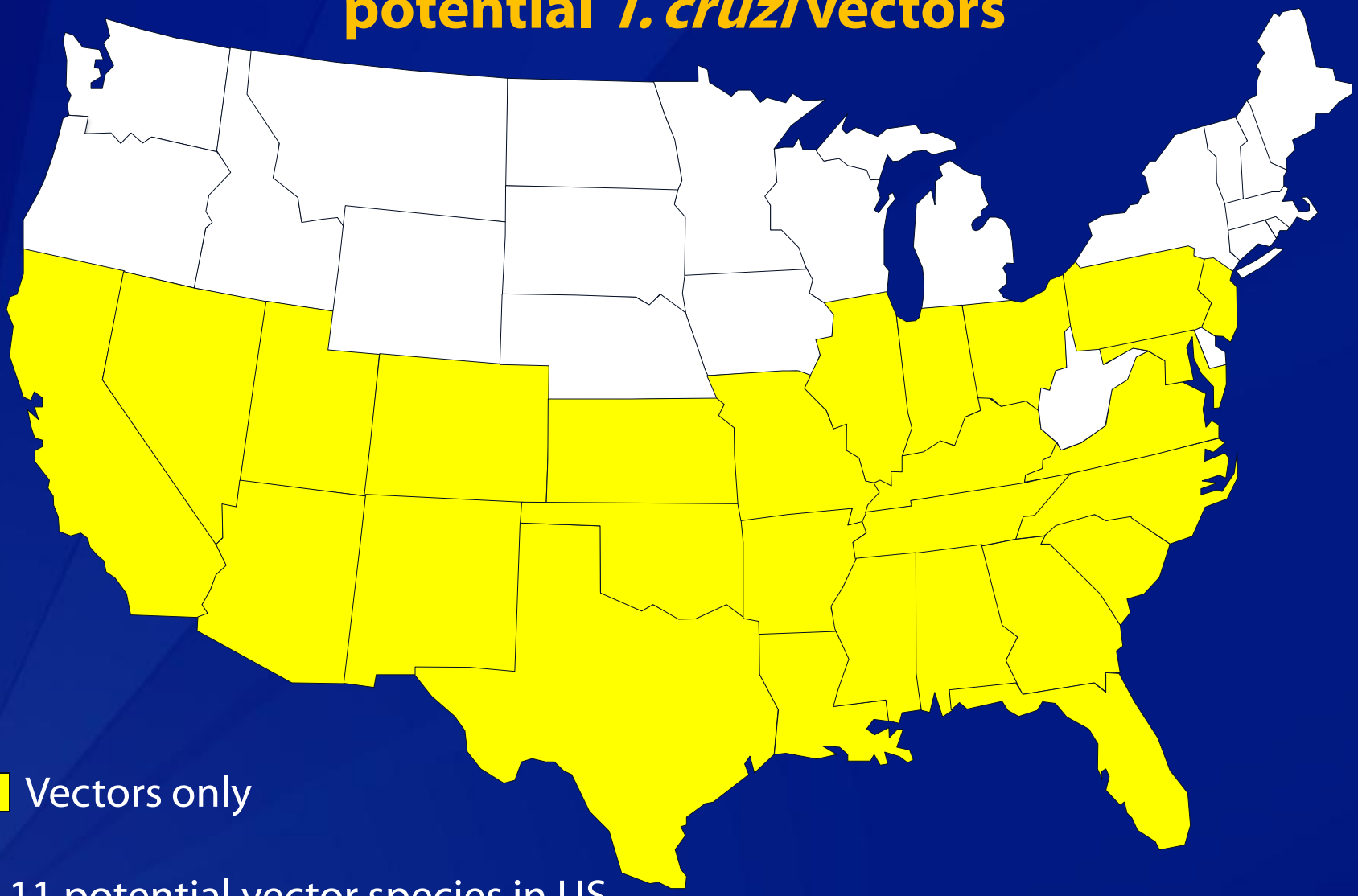
- **Five published cases**
  - 2001 cluster of 3 cases from same donor
  - 2006 heart transplant—other transplanted organ recipients negative
  - 2006 heart transplant—other transplanted organ recipients negative
- **Recent transmission to heart transplant recipient (unpublished)**
  - Successfully treated
  - Other organ recipients negative
- **Other suspected cases investigated but no documented transmission**

Transfusion transmission in the U.S. and Canada

- 7 transfusion transmission cases reported, U.S. and Canada
- Two more transfusion transmission cases reported at 2010 AABB meeting, both platelet recipients from same donor (Argentina)

Year	Recipient residence	Country of donor
1987	California	Mexico
1989	New York City	Bolivia
1989	Manitoba	Paraguay
1993	Houston	unknown
1999	Miami	Chile
2000	Manitoba	Paraguay
2002	Rhode Island	Bolivia

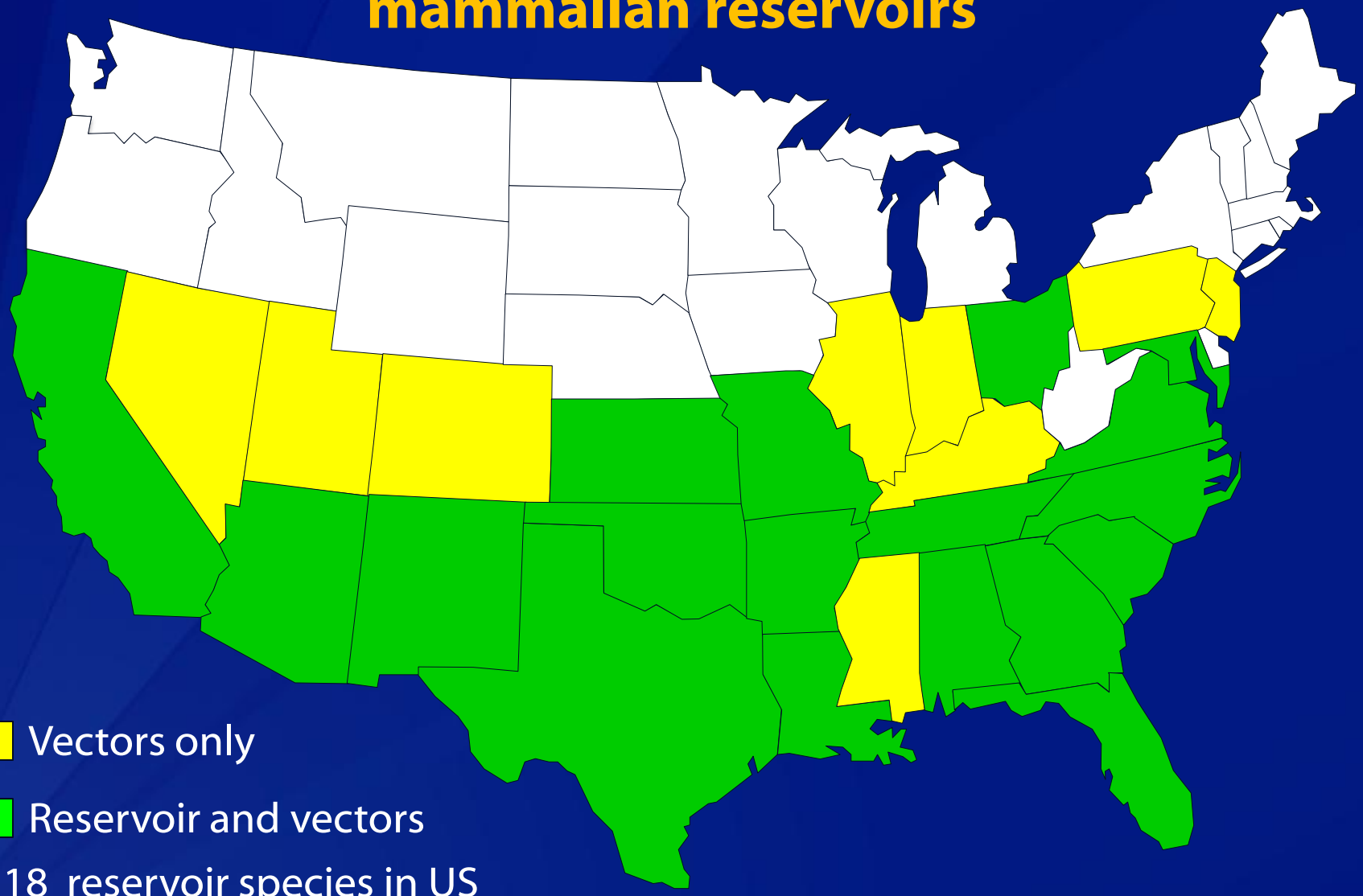
States with documented potential *T. cruzi* vectors



Vectors only

~ 11 potential vector species in US

States with documented mammalian reservoirs



>18 reservoir species in US

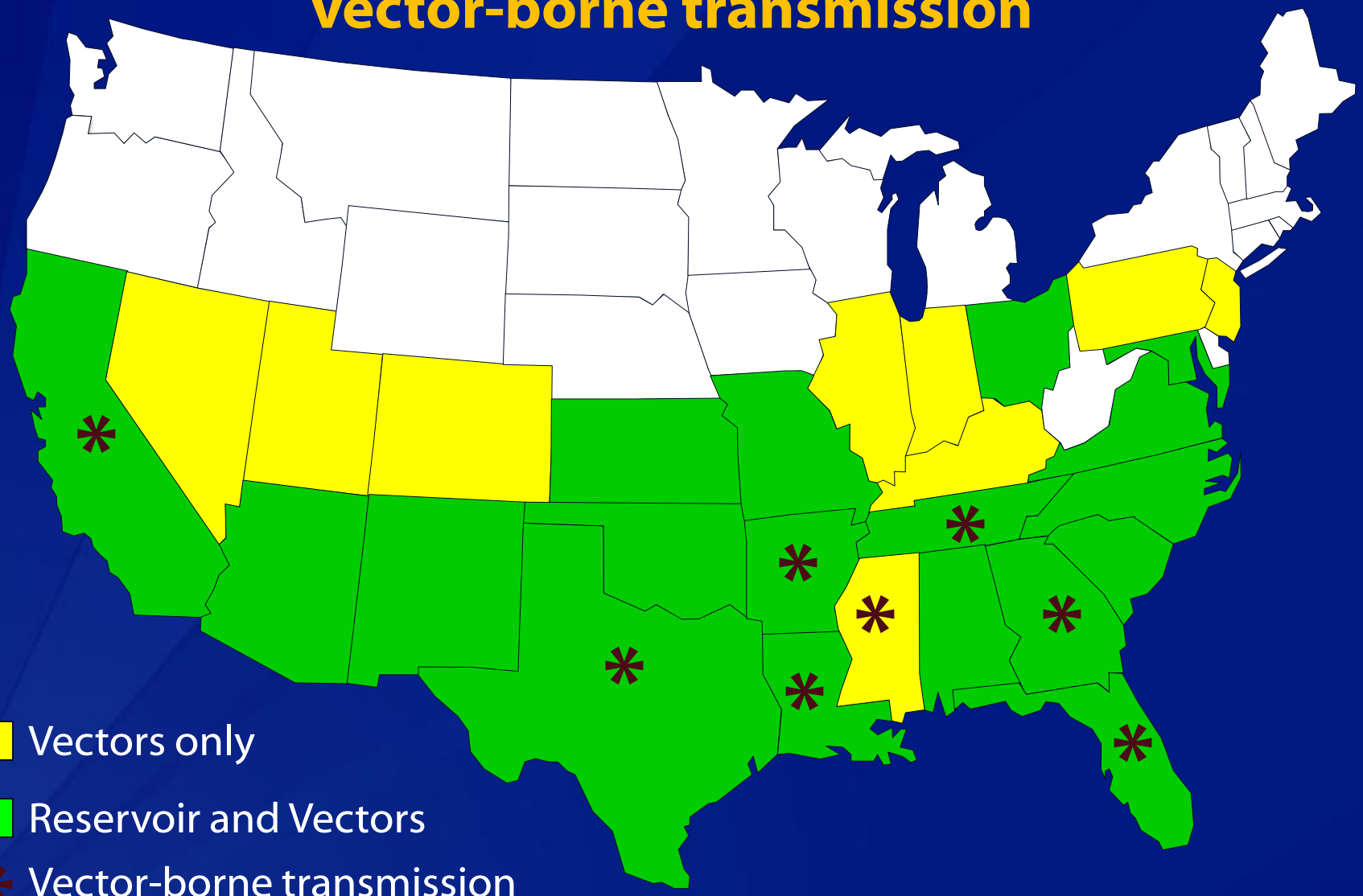
Autochthonous transmission in the U.S.

- Sylvatic cycle below 40th parallel
- Seven autochthonous human cases published
- At least 15 additional cases among blood donors*

Year	State	Patient
1955	Texas	infant
1955	Texas	infant
1982	California	56 year old woman
1983	Texas	infant
1998	Tennessee	infant
2006	Louisiana	74 year old woman
2006	Texas	infant

* Reported at 2010 AABB annual conference,

States with possible vector-borne transmission

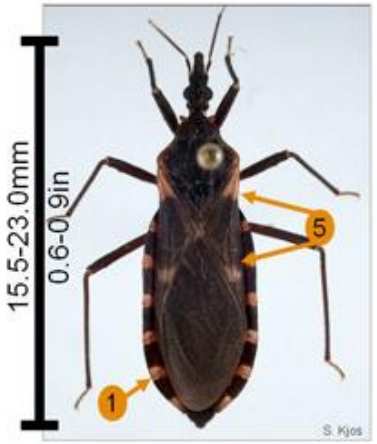


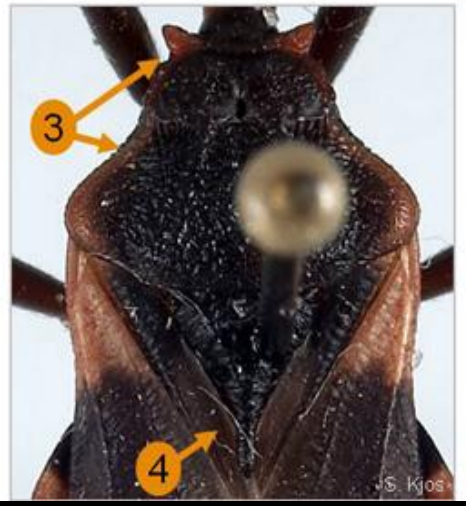
Have you seen *Triatoma sanguisuga*?

Triatoma sanguisuga

Key characteristics:

1. Orange-red to yellowish horizontal markings covering ≥¼ of abdominal segment
2. Mouthparts relatively hairless
3. Pronotum black with orange-red to yellowish side and top margins
4. Tip of scutellum long, narrow
5. Distinctive orange-red to yellowish markings on wings





Special thanks to Dr. Sonia Kjos

Dogs in the U.S. and Chagas disease

- **Dogs with Chagas disease reported in Texas and Louisiana, other southern states**
- **Route of infection most likely oral—eating infected bugs**
  - Hunting dogs, dogs housed outdoors
- **Canine acute and chronic *T. cruzi* infection**
  - Acute disease more frequently severe, possibly due to dose and route of infection
  - Not all chronically infected develop clinical disease
  - Cardiac arrhythmias, myocarditis, heart failure
- **Treatment approaches extrapolated from human studies but drugs are not approved in the U.S.**

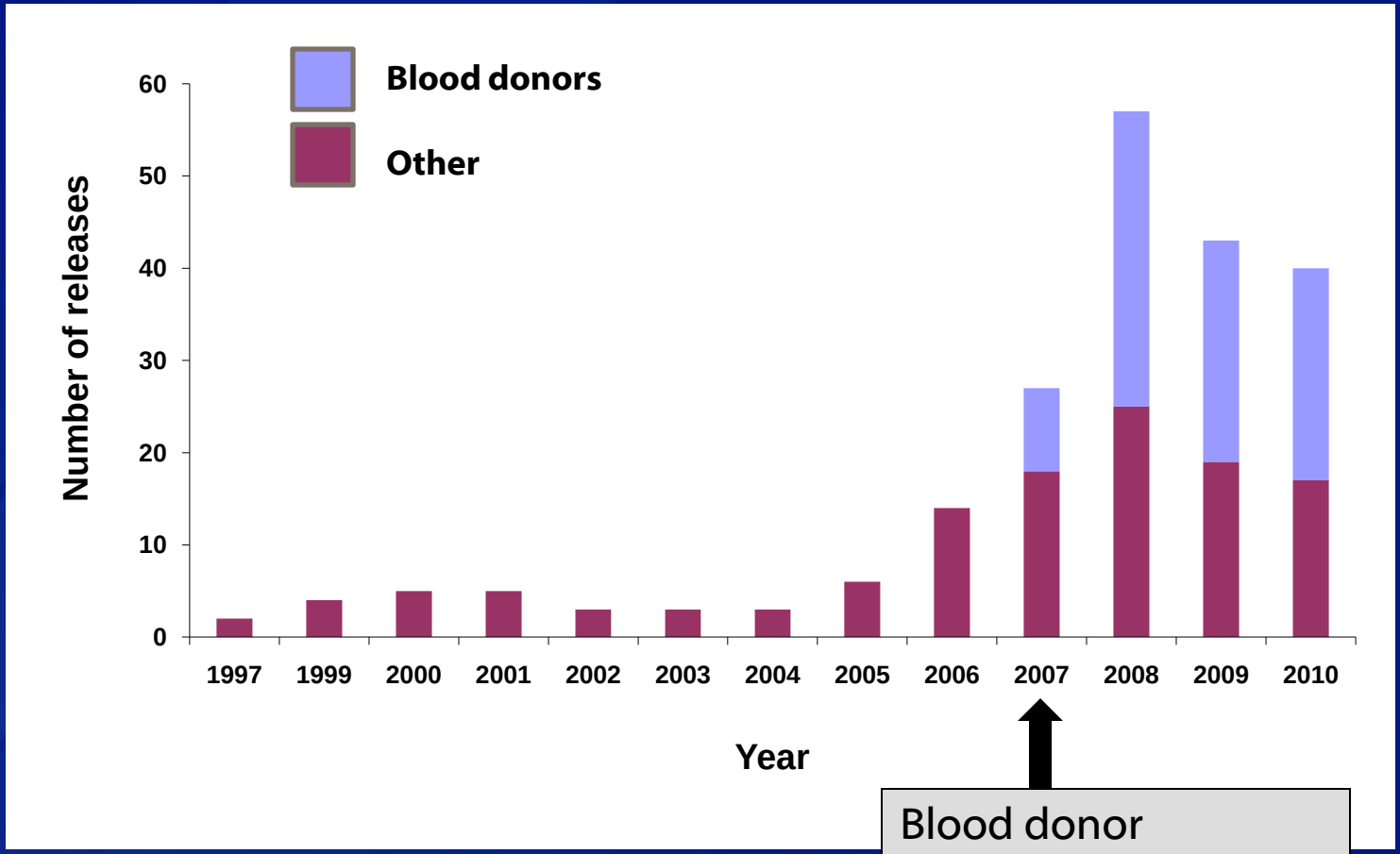
Public health challenges

- **Health care system**
  - Physician awareness and education
  - Awareness in populations at risk
- **Public health system**
  - Not nationally notifiable, reportable in AZ, MA, and TN
  - Low testing capacity at local / state public health laboratories
- **Defining the U.S. burden of disease and risk**
  - Cardiac disease morbidity and mortality
  - Gastrointestinal disease burden
  - Congenital transmission
  - Autochthonous infections and their outcomes
- **Emerging concern for transplant transmission risk and prevention**

Public health interventions for Chagas disease in the United States

- **Physician awareness**
  - KAP surveys among physicians, including OB/GYN, transplant medicine, infectious disease
  - Chagas disease CME online
- **Ensuring treatment drug availability**
  - FDA approval to maintain drug stocks at CDC
  - Release of treatment drug for individual patients under IND protocols
- **Preventing transfusion transmission by blood donor screening**
- **Preventing transplant transmission**

CDC nifurtimox releases by year 1997 – 2010*



* as of November 10, 2010

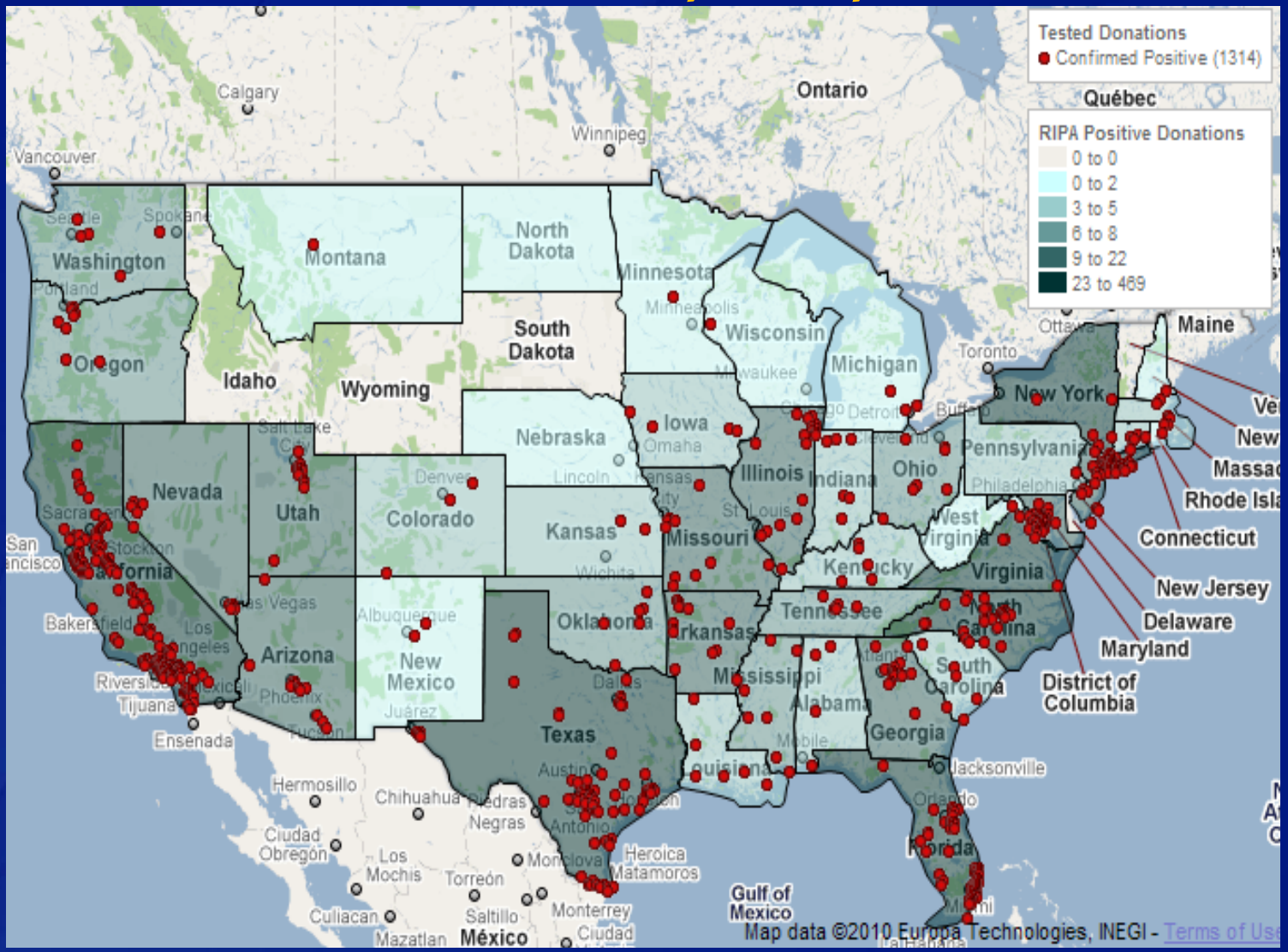
December 2006: FDA approves first blood donation screening assay for antibody to *T. cruzi*

- **Testing started in early 2007**
- **No final guidance from FDA**
  - Blood centers not required to screen for Chagas disease
  - Industry organization (AABB) developed voluntary guidelines for screening
- **Donors deferred based on reactive test in duplicate (some centers also confirming with RIPA)**
- **~14 million donations screened in first 16 months**
  - Approximately 28% confirming by RIPA
  - ~1:27,500 donors RIPA positive
  - ~1:3,800 South Florida
  - ~1:8,300 Southern California (previously deferred donors not included)

Recent changes to blood donor screening

- **Currently ~90% of the blood supply is screened**
- **BUT many blood centers now screening donors once**
  - If positive, deferred indefinitely; if negative future donations not tested
  - Cost concerns
  - Few / no reports of transfusion transmitted Chagas disease
  - What are they missing with this approach?
    - New infections?
    - Donors who test close to assay cutoff level?
- **FDA approves second assay in April 2010 (different manufacturer)**

Confirmed positive blood donors 2007 – 2010*, n = 1,314



*Source: AABB Biovigilance program, as of November 24, 2010

Strategies to prevent and control transplant-associated transmission

- **No regulation regarding screening for *T. cruzi* infection in organ donors**

- **Education regarding risk of transmission by organ type**
- **Some organ procurement organizations (OPOs) screen donors for *T. cruzi* infection**
  - Only certain tests suitable for this purpose
  - Additional OPOs considering targeted screening
- **Monitoring recipients post-transplant**
  - Parasitological testing (buffy coat preps, PCR) during first few months and/ or when rejection event or illness occurs
  - Prompt treatment associated with better outcomes

CDC Chagas disease resources

- **CME Chagas disease: What U.S. physicians need to know**
  - http://www.cdc.gov/parasites/cme/chagas/index.html
- **CDC Chagas disease website**
  - http://www.cdc.gov/parasites/chagas
  - One page information sheets for physicians and the public
  - Frequently asked questions regarding blood donation screening
  - Expanded information on vectors in the U.S.
- **Parasitic Diseases Inquiries (770) 488-7775, chagas@cdc.gov**

Acknowledgements

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Thank you!

For more information please contact Centers for Disease Control and Prevention

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